Visualization of Operational Performance in Biometric Systems

The Zoo and Beyond

NIST Biometric Performance Conference

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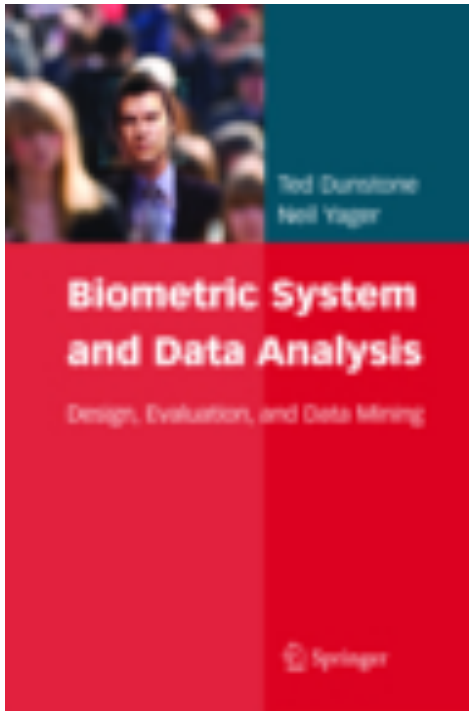
- Setting up and monitoring complex large scale biometric systems is costly, difficult and time consuming.
- What is needed in a testing/monitoring tool to automate the process & reduce cost
  - Accurate
  - Vendor Neutral
  - Uni/Multi-Modal
  - No Data Size Limit
  - Extensible
- We have built a tool where we have developed several new testing and visualization techniques, including zoo analysis.



http://www.springer.com/computer/image+processing/book/978-0-387-77625-5

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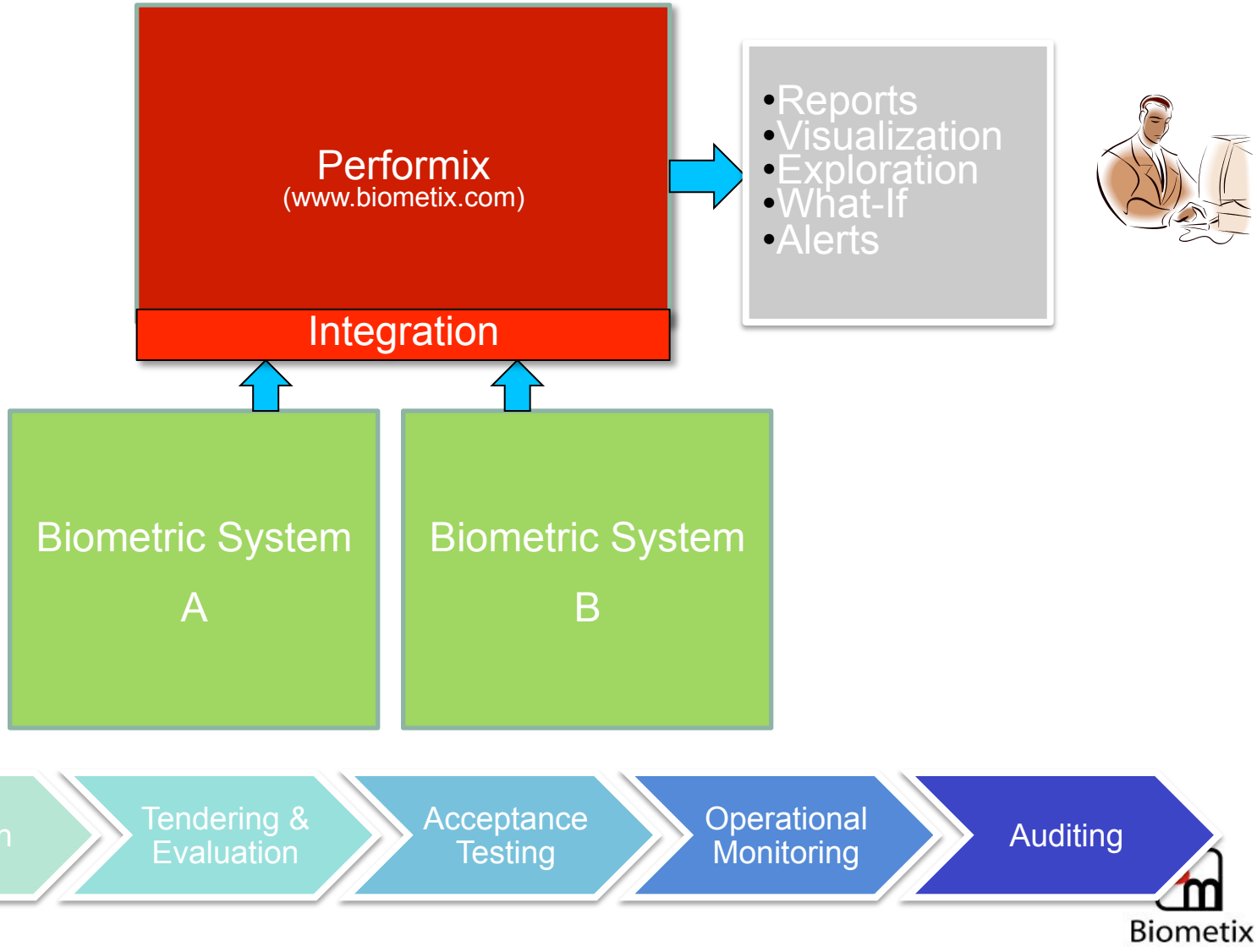
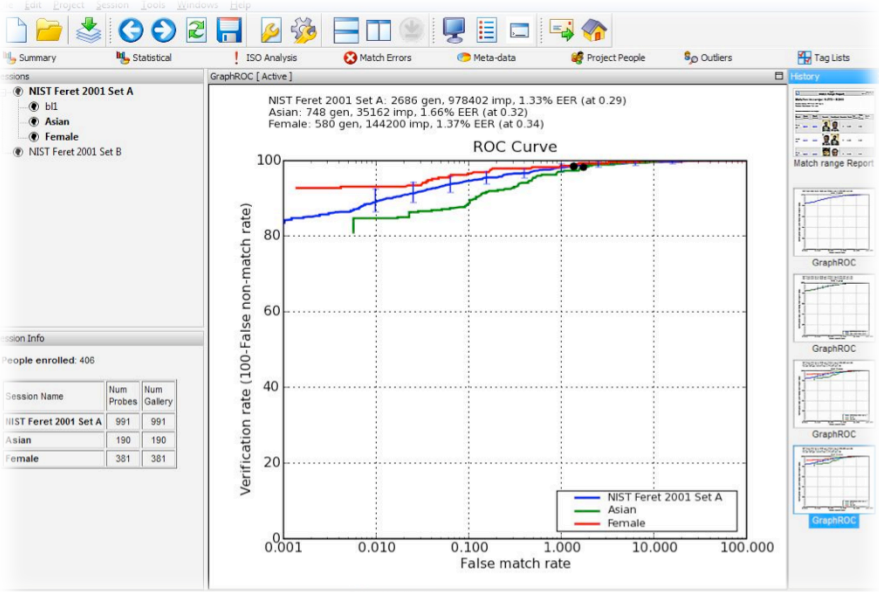
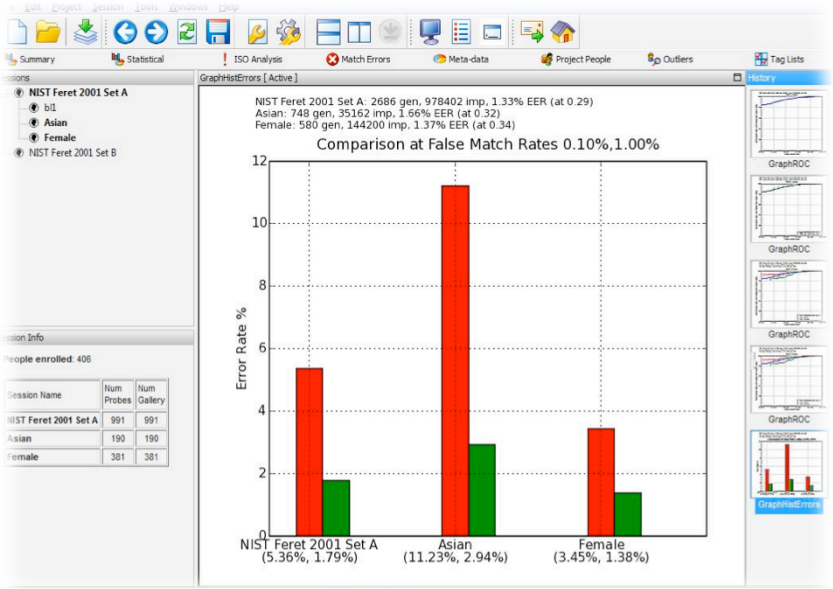
Testing & Monitoring Framework



Standard Group Statistics





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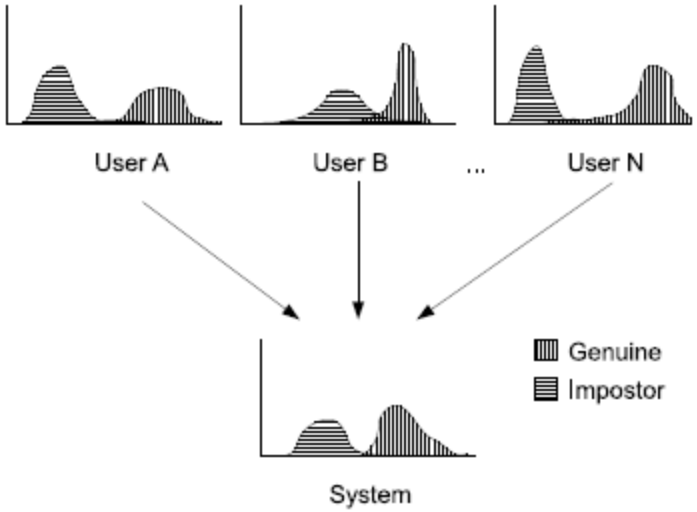
Zoo Analysis: Individual Analysis



Physiology, Data Capture, Behaviour

http://www.computer.org/portal/web/computingnow/0210/theme/tpami

Yager, N., Dunstone, T.: The Biometric Menagerie. IEEE PAMI Feb 2010

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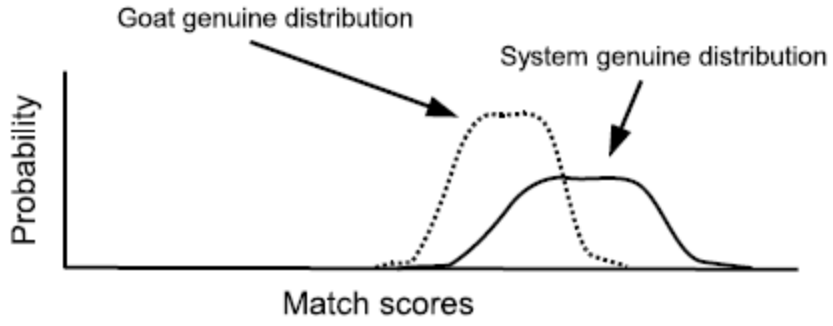
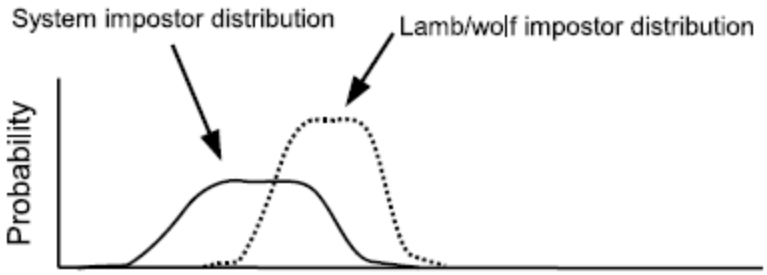


(a)



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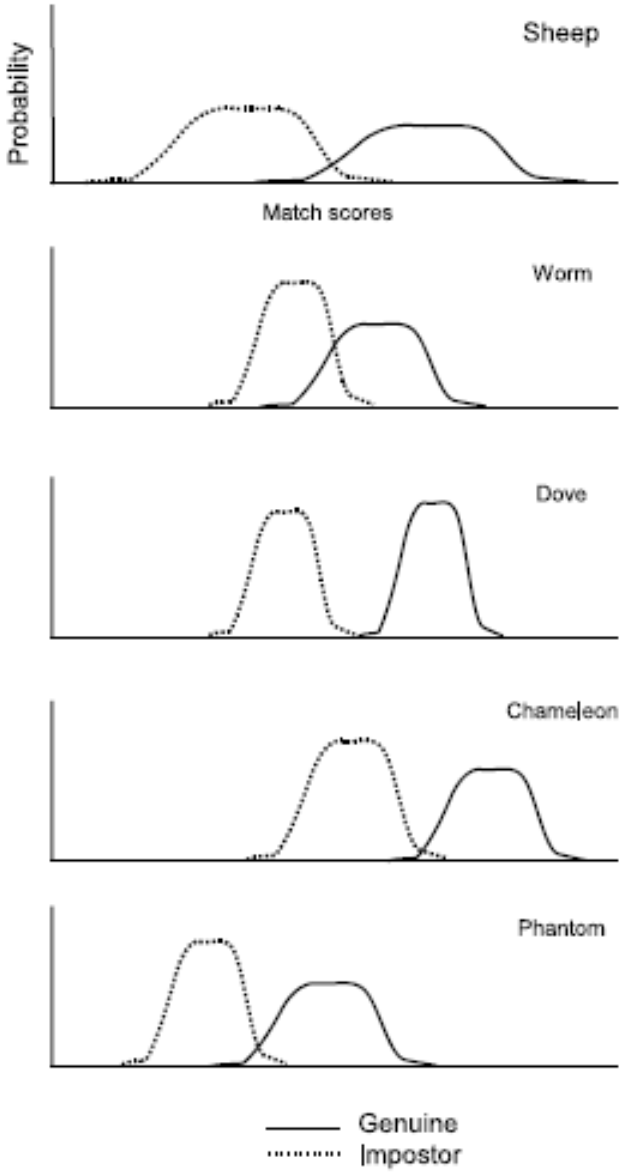

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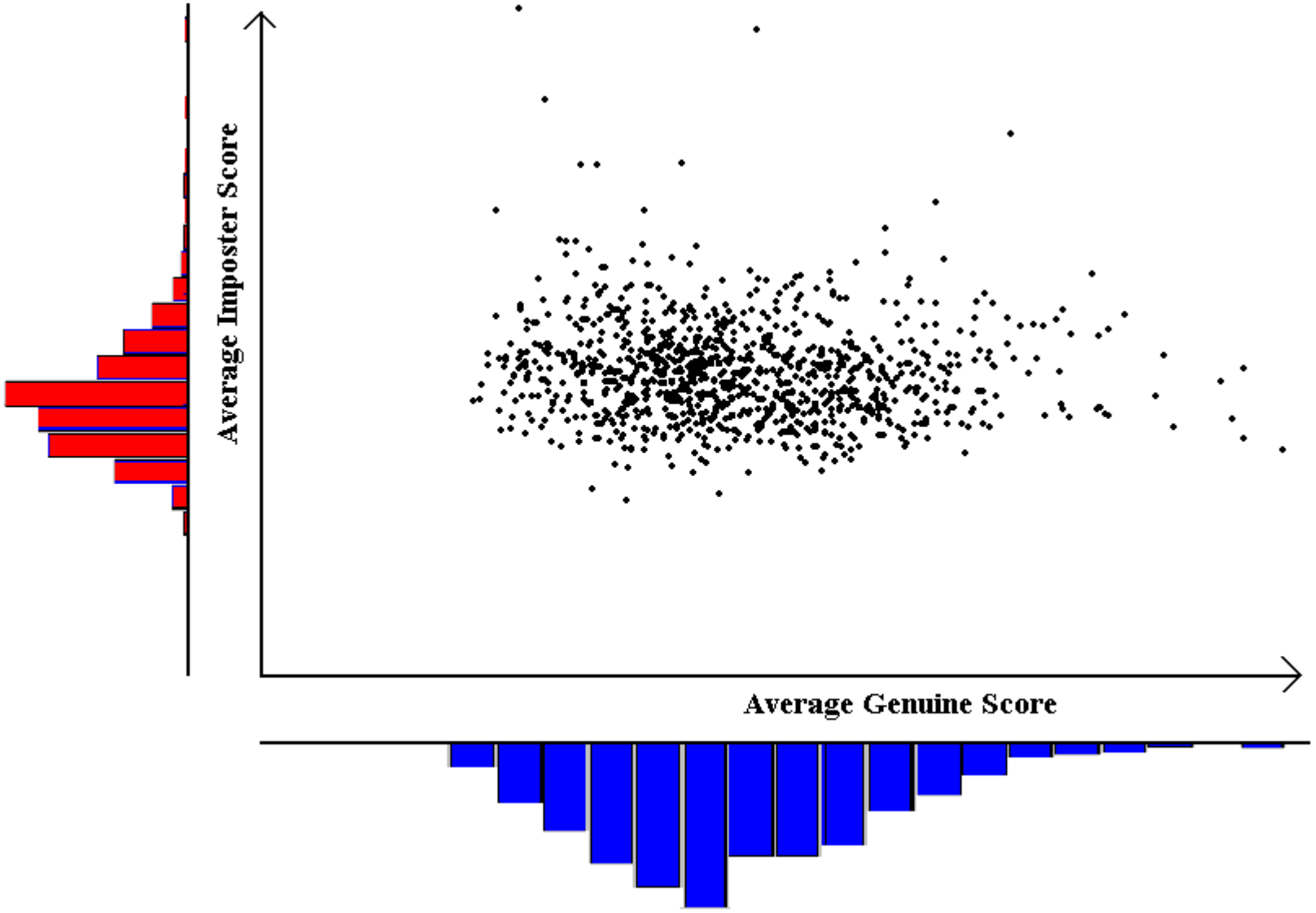

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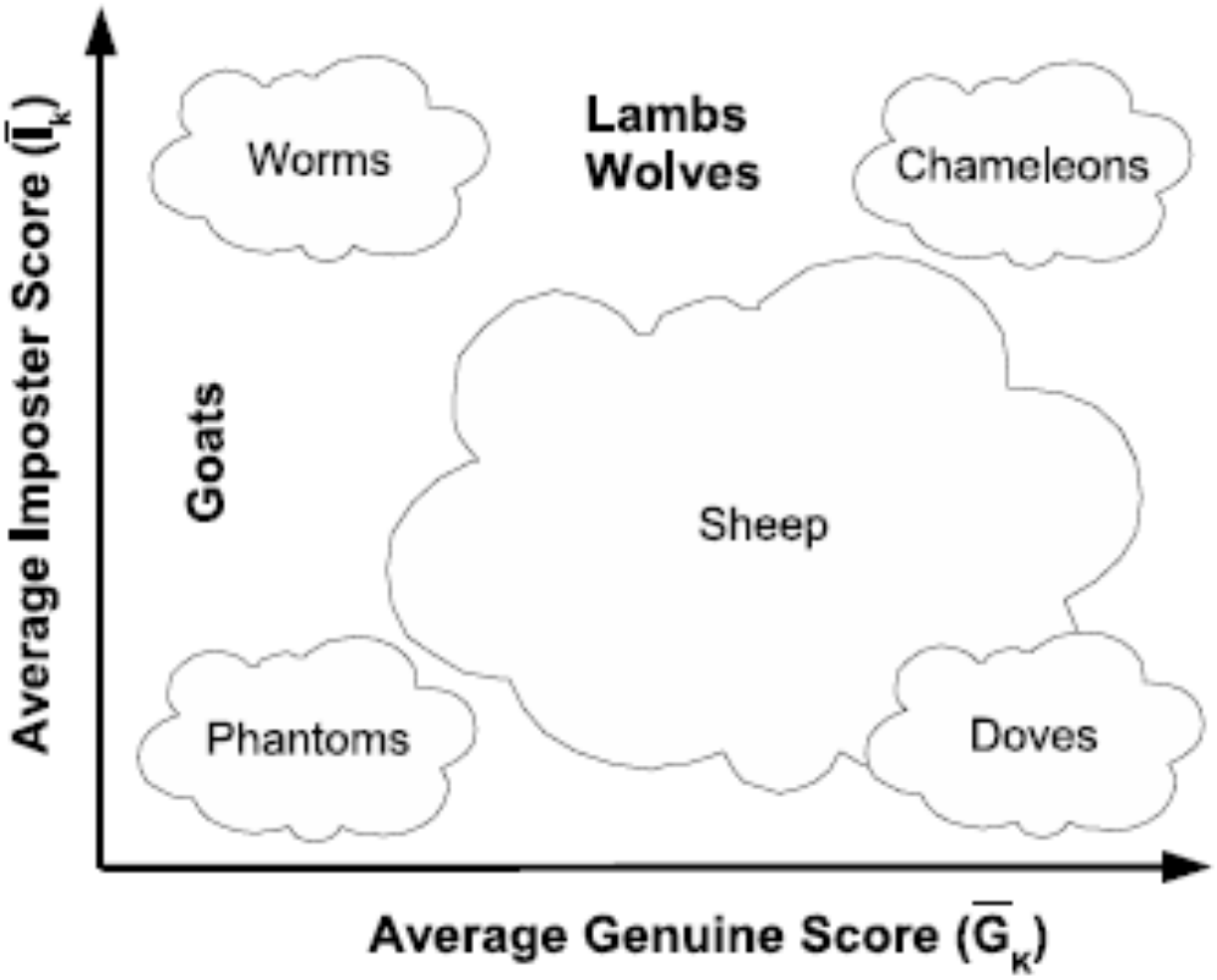

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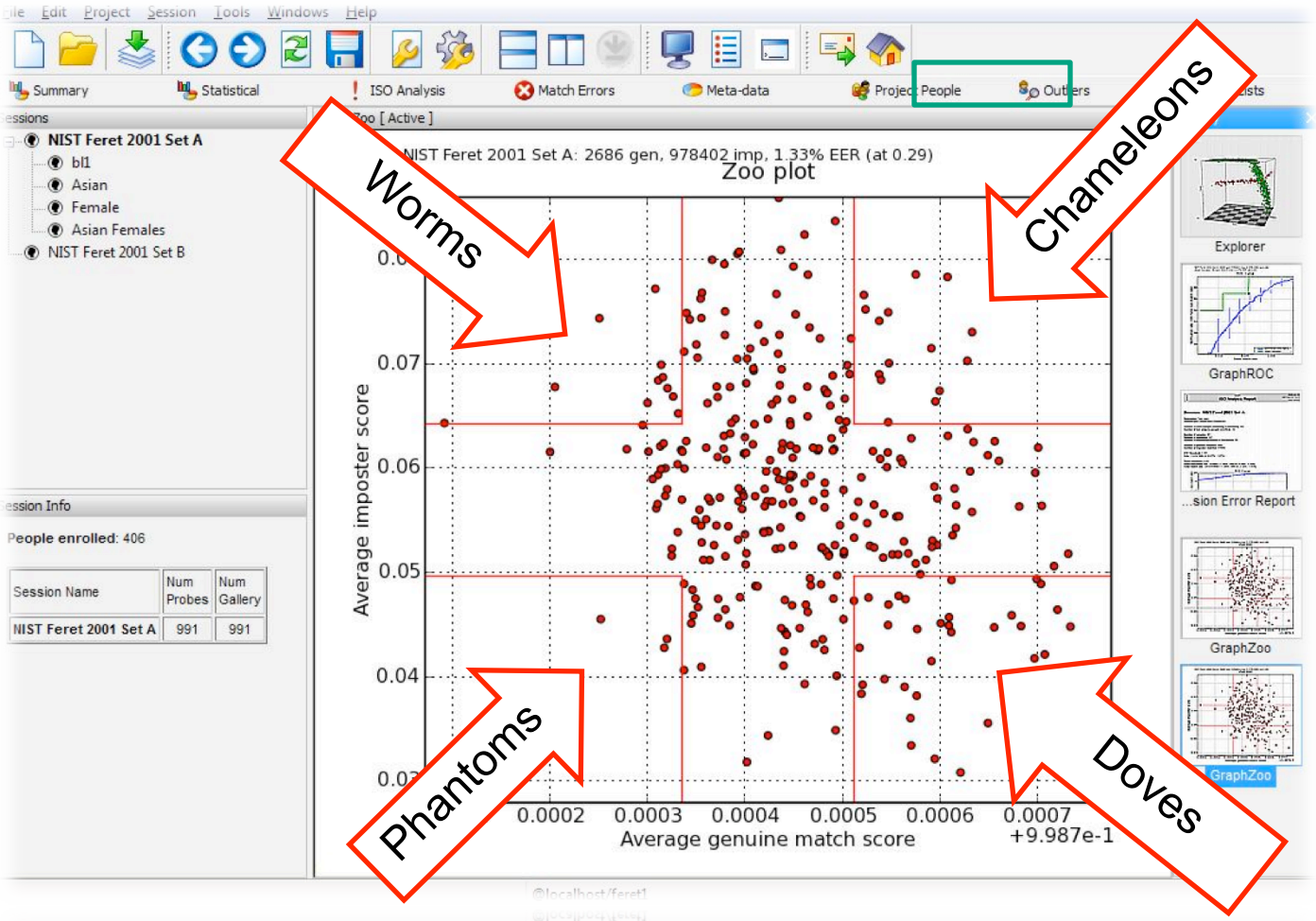
Basic Zoo Graph



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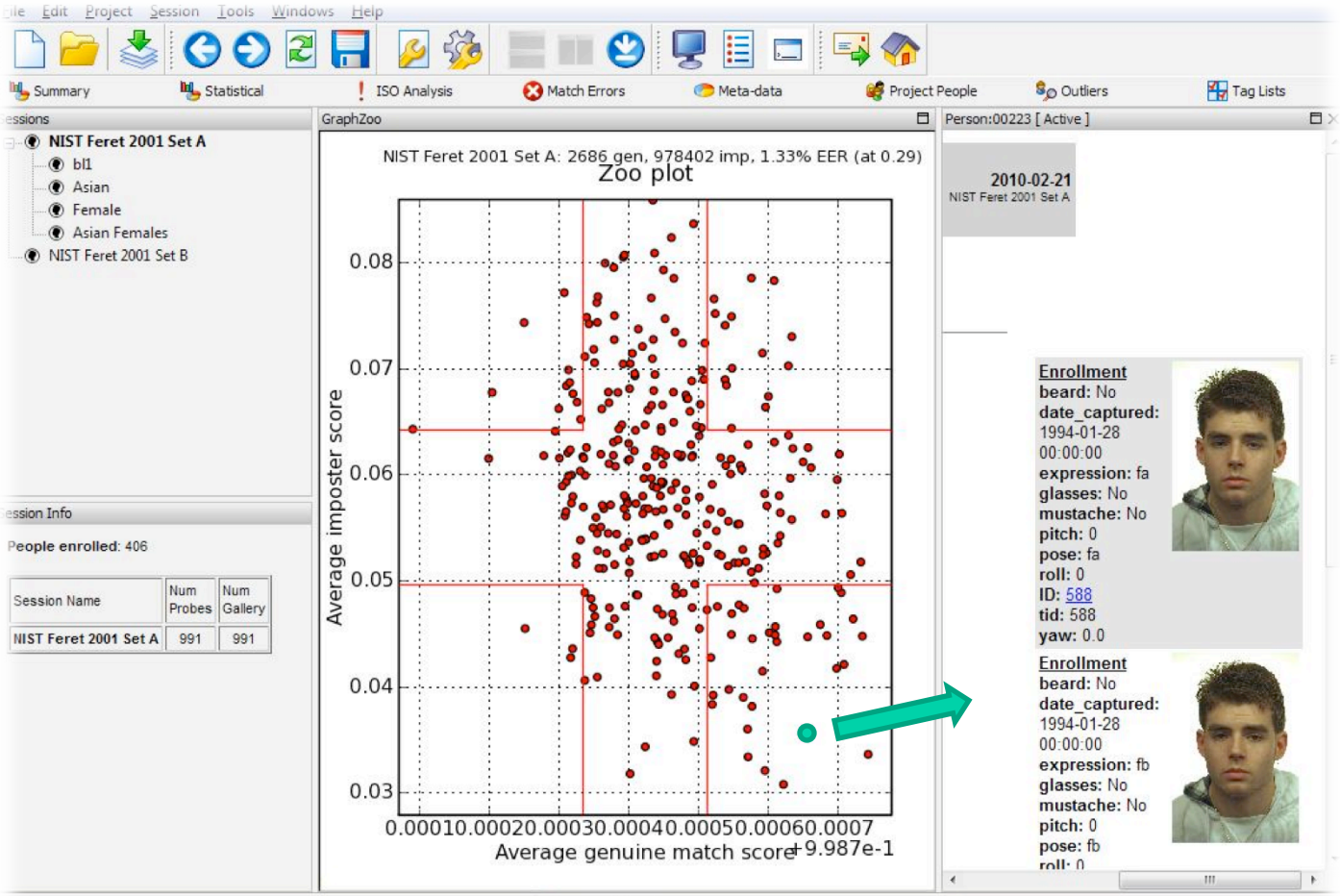
Zoo – Dove (Good Users)



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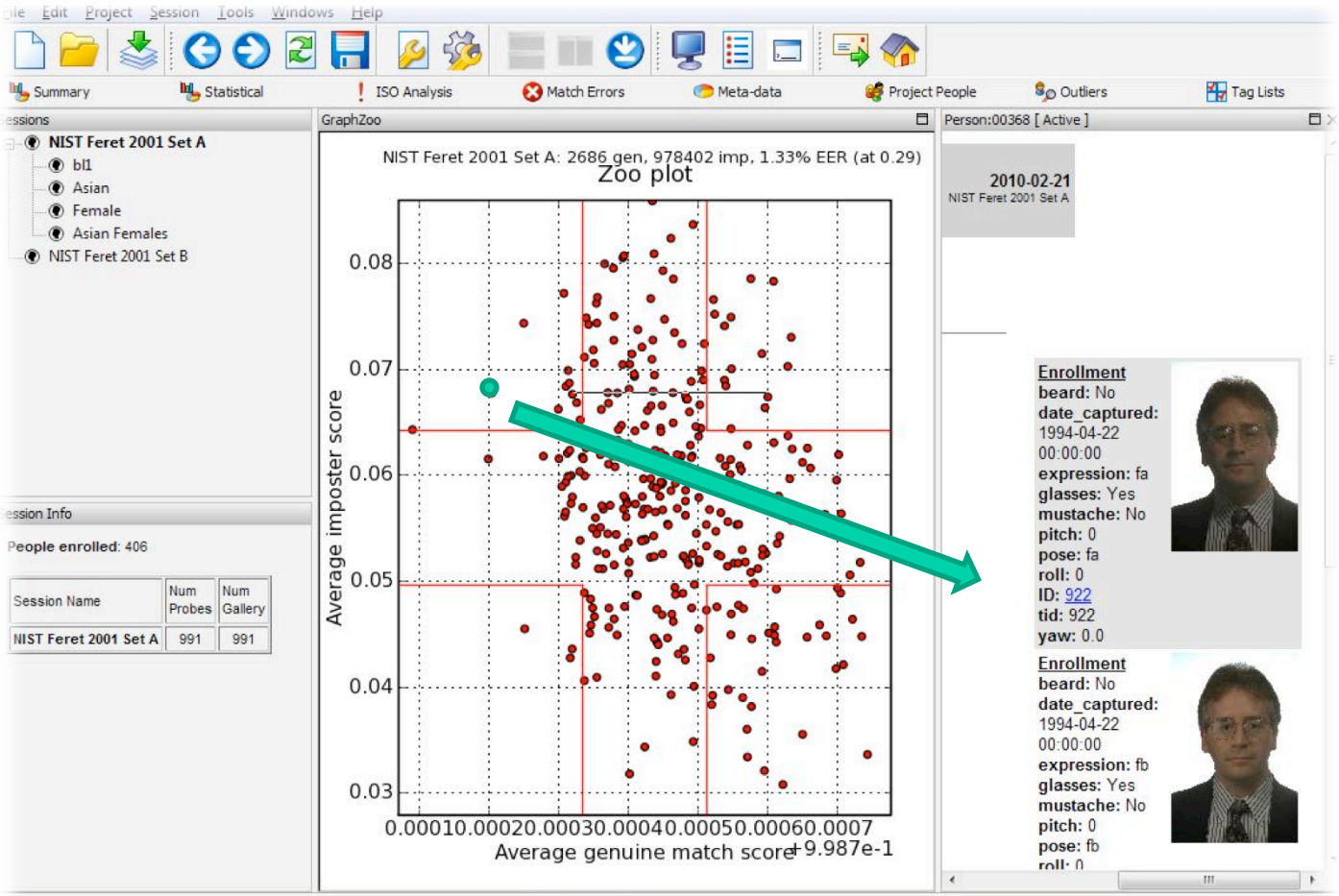
Zoo - Worms (Bad) – Fix: Reduce Glasses Glare



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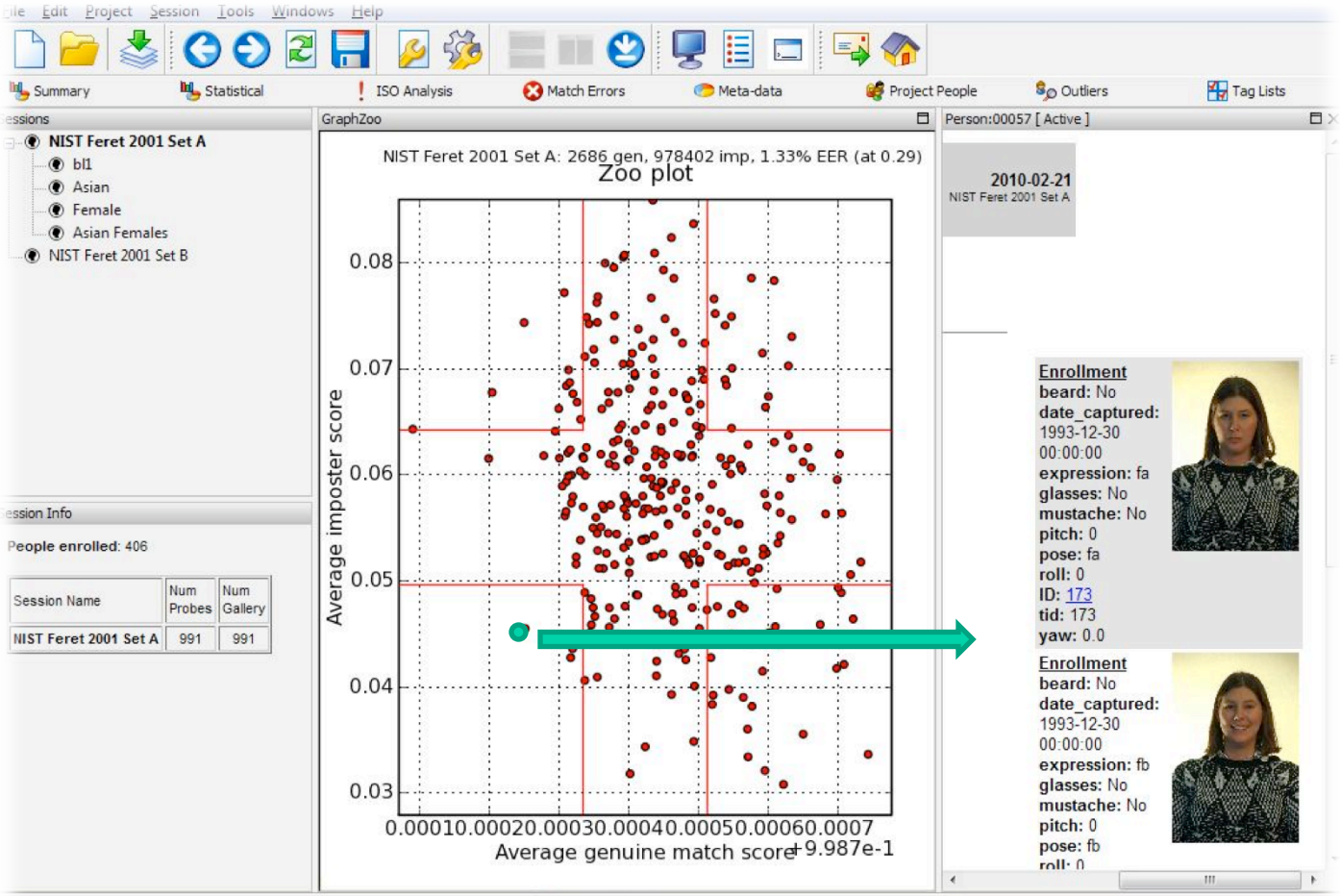
Zoo – Phantoms(Bad)
- Fix: Improve Lighting



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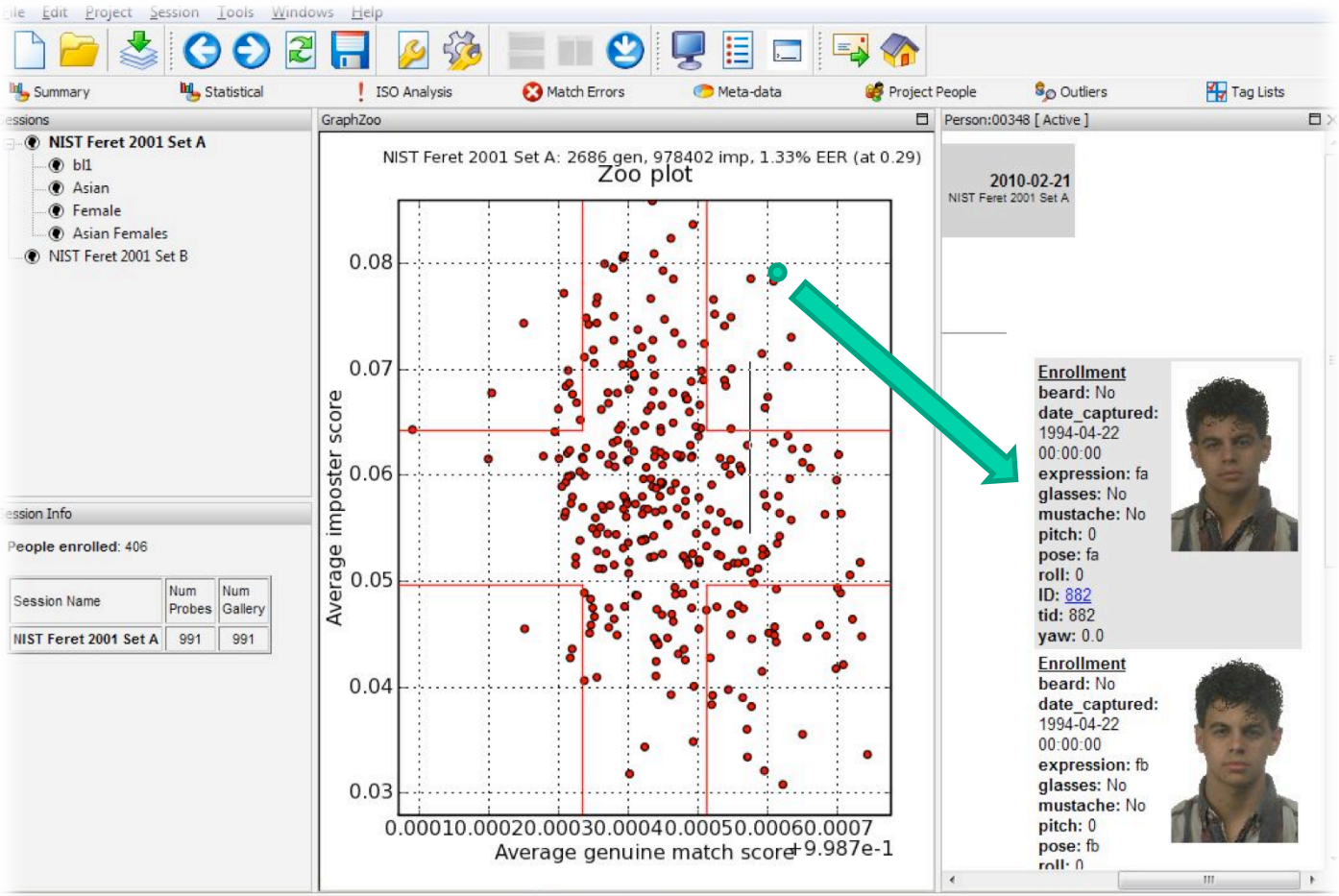
Zoo – Chameleons (Bad)
- Fix: Look for Vulnerabilities



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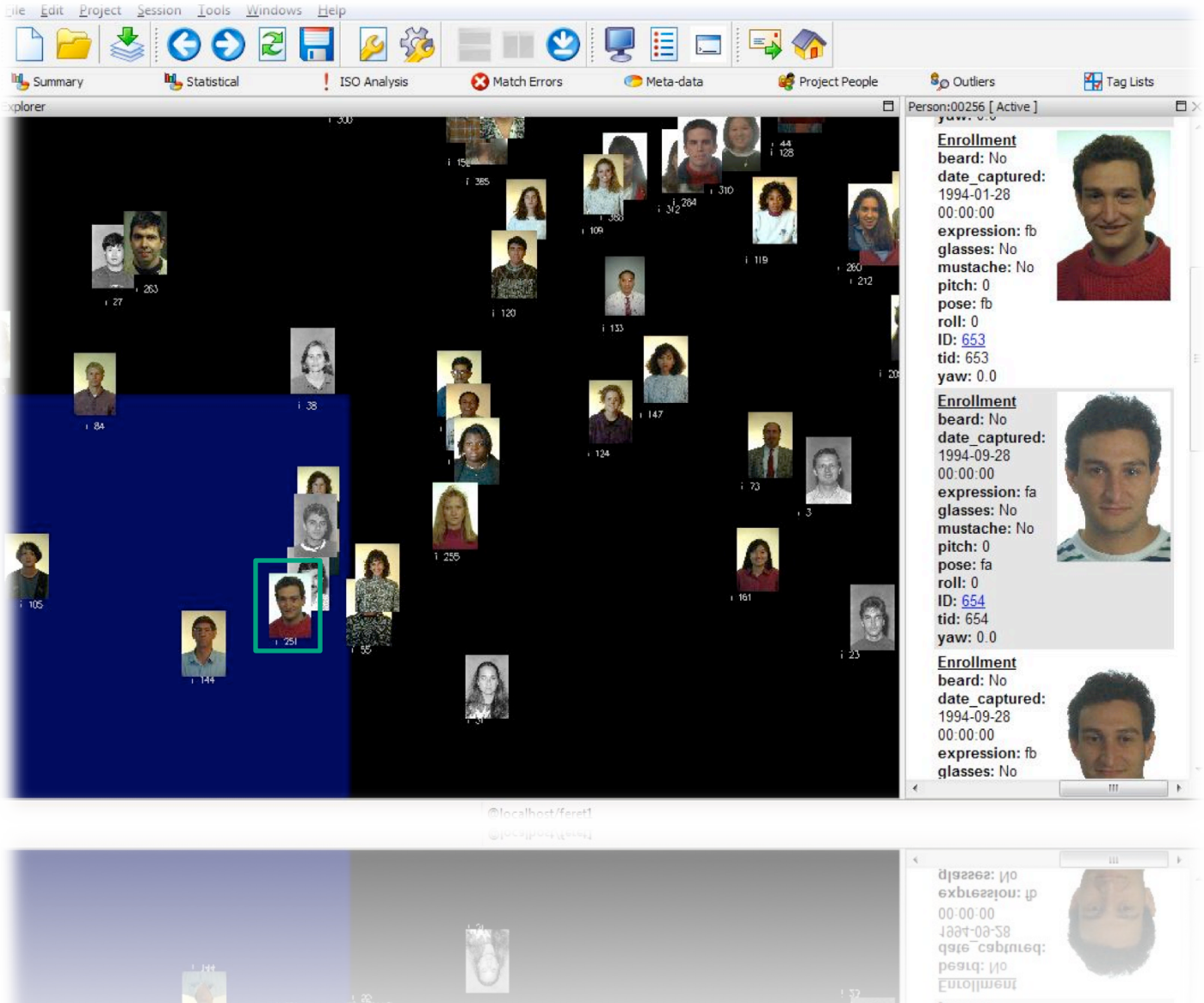
Zoo Explorer - Investigation



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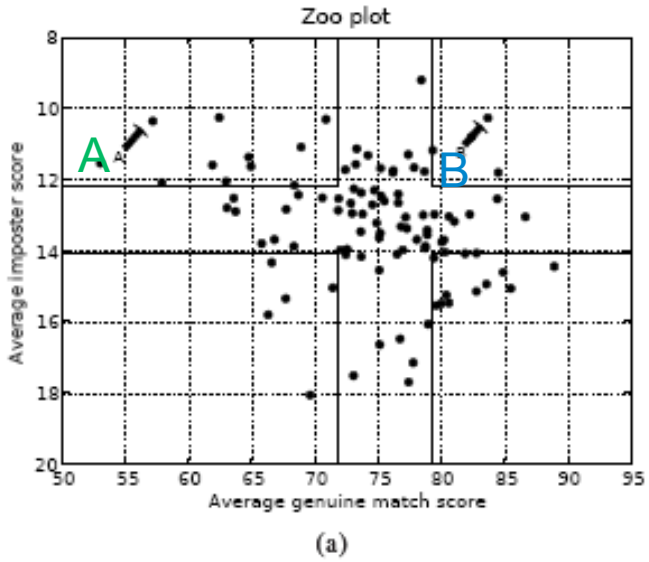
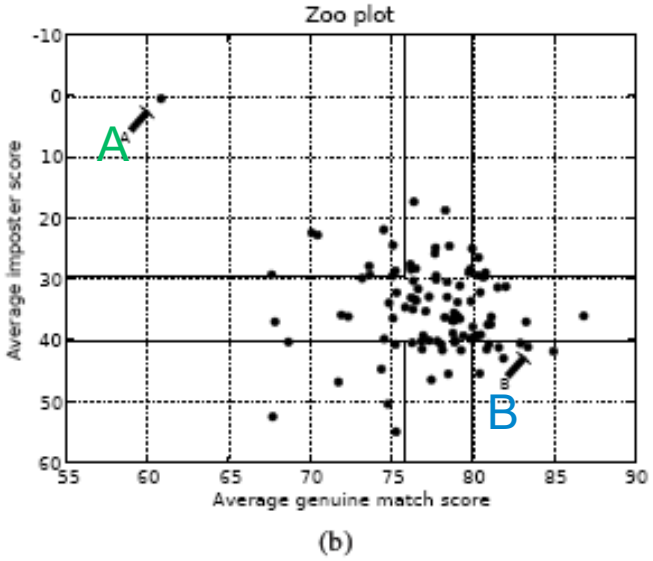
(phantom)



(dove)

(phantom)



A B

(chameleon)

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System	Population	Genuine Matches	Impostor Matches	EER
Fingerprint - Alg I	100	56	99	0.9%
Fingerprint - Alg II	100	56	99	3.4%
2D Face - Alg I	200	5	759	4.3%
2D Face - Alg II	200	5	759	1.7%
Speech	200	5	759	4.4%
Iris	208	3-11	1952-3600	2.4%
3D Face	249	1-120	4005-10000	1.6%
Keystroke - Alg I	289	3	37-128	5.3%
Keystroke - Alg II	289	3	37-128	3.8%
Synthetic Data	300	7-32	44-91	3.7%

Pearson product-moment correlation coefficient is computed between the users' average genuine scores and their average imposter scores to determine relationship

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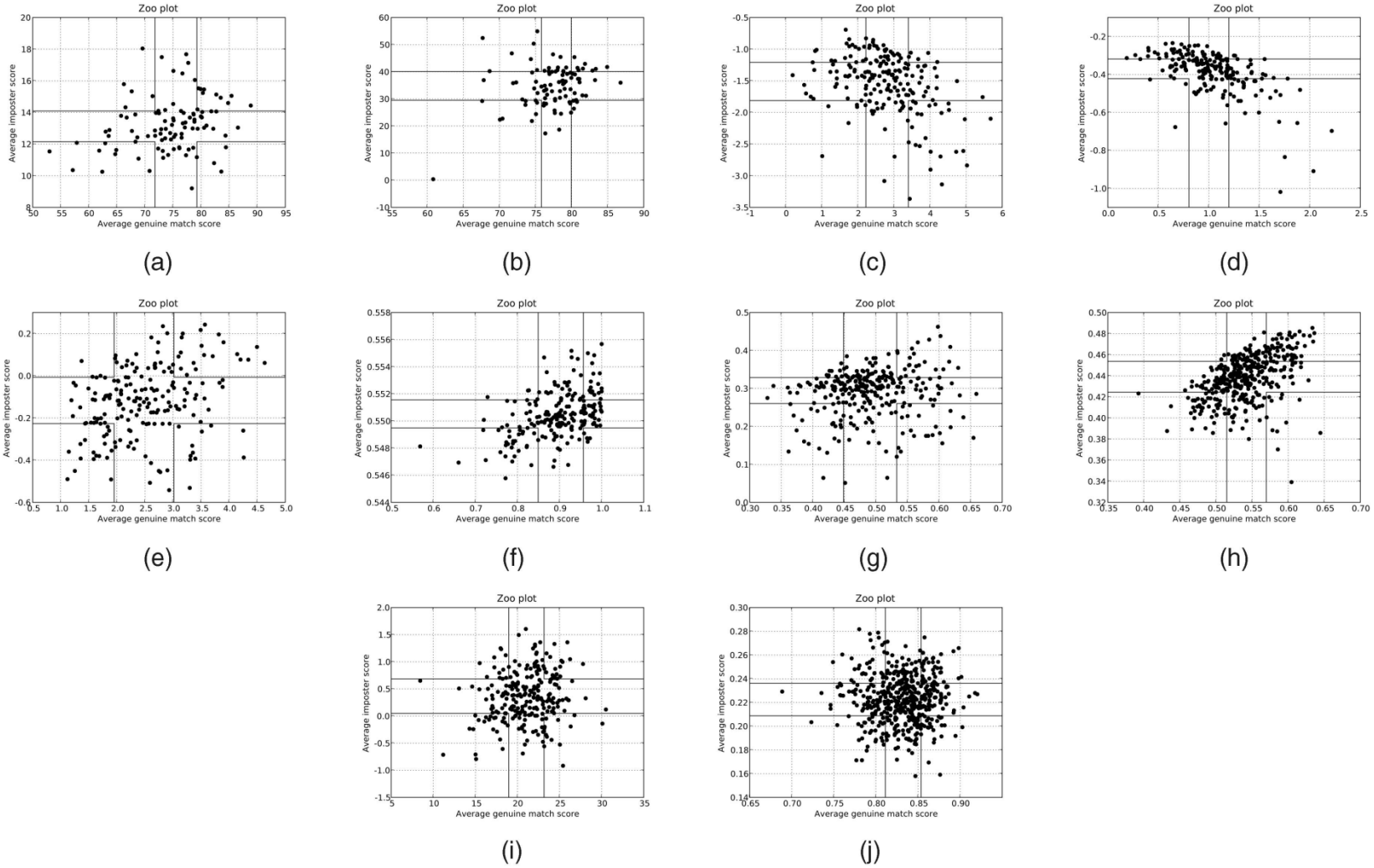

(a) Fingerprint - Alg I. (b) Fingerprint - Alg II. (c) 2D Face - Alg I. (d) 2D Face - Alg II. (e) Speech. (f) Iris. (g) Keystroke -Alg I. (h) Keystroke - Alg II. (i) 3D Face. (j) Synthetic

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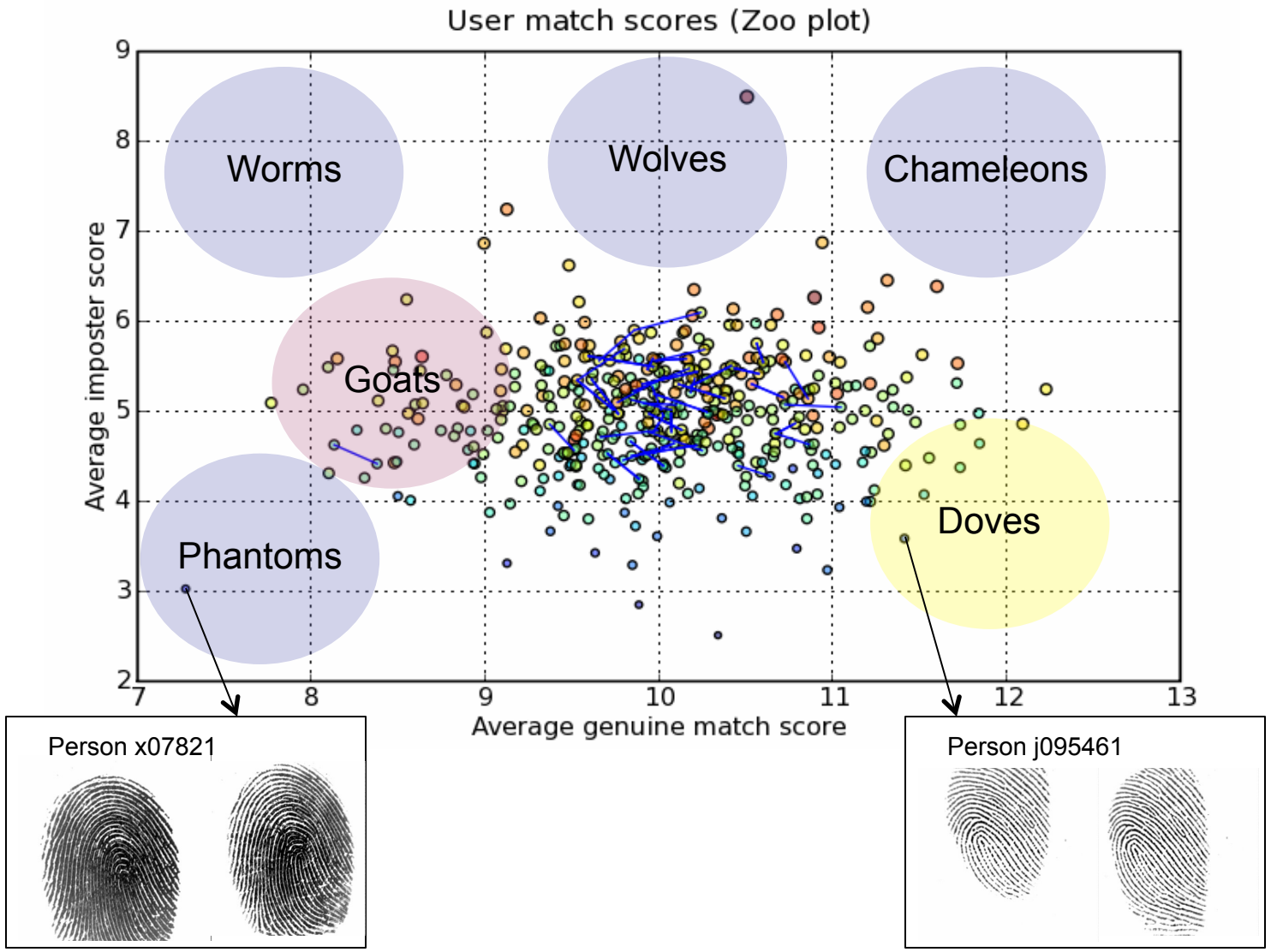
Performix Explore – Zoo Analysis



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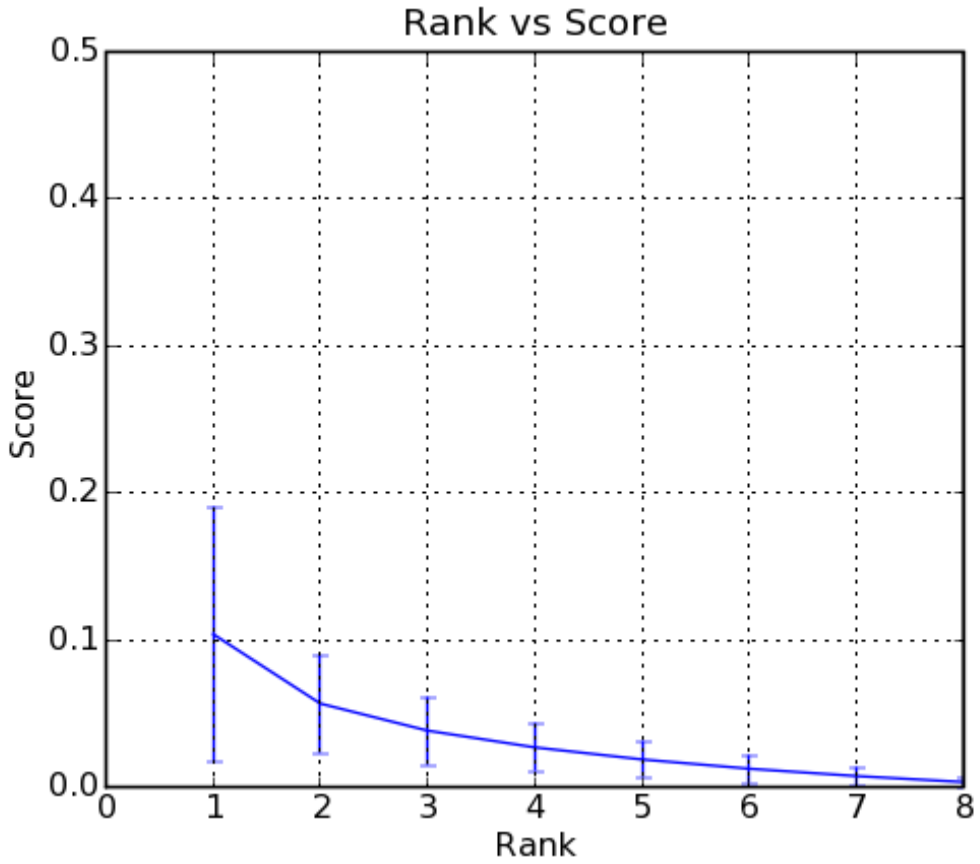
Scores Distribution by Rank



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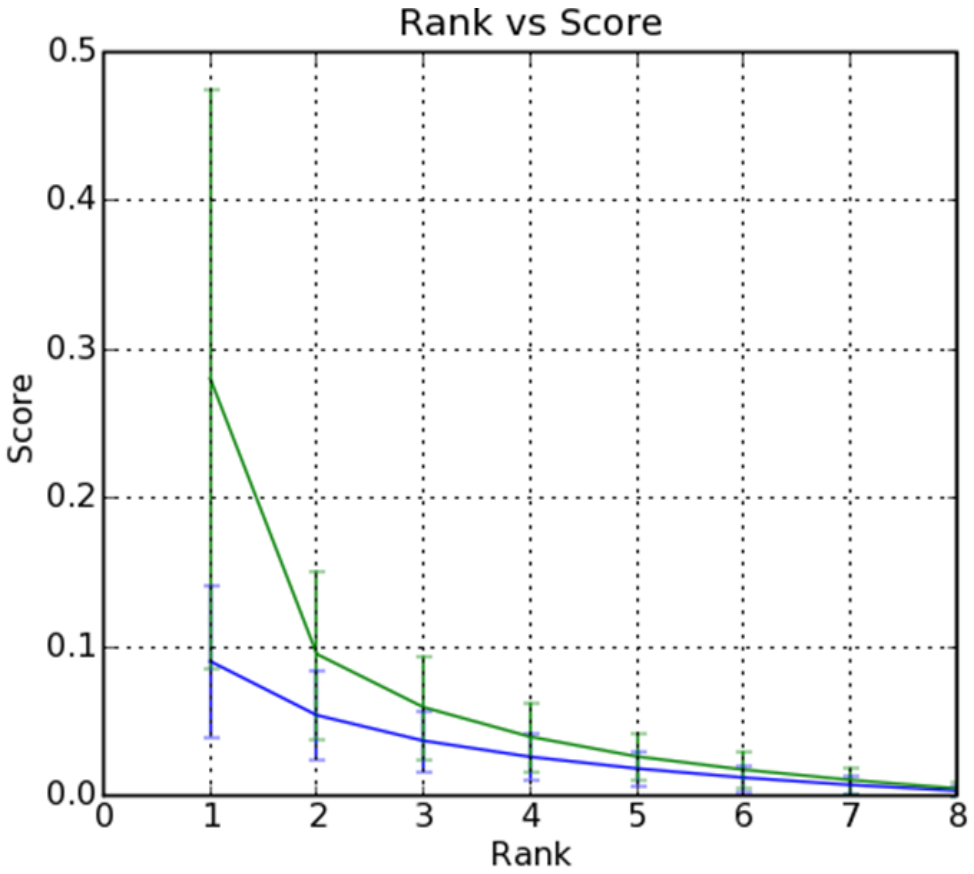
Rank - Genuine vs Impostor



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Performix Demos

- FERET
  - Quality vs Score
  - Waterfall Diagram
  - Simulated Clearance
- Surveillance
  - Hotspot Analysis
  - Frame Analysis
  - Comets

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Human Operator Evaluation

- Performix can assist with Operator Training and Evaluation
- Matchers = Operators
- Training
  - Identity Weakness
  - Report on operator improvements
  - Provide feedback to supervisor

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Questions

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